



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,308	06/23/2006	Harue Nakashima	0756-7725	8956
31780	7590	02/18/2010	EXAMINER	
ERIC ROBINSON			YANG, JAY	
PMB 955			ART UNIT	
21010 SOUTHBANK ST.			PAPER NUMBER	
POTOMAC FALLS, VA 20165			1794	
			MAIL DATE	
			DELIVERY MODE	
			02/18/2010	
			PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/584,308

Applicant(s)

NAKASHIMA ET AL.

Examiner

J. L. YANG

Art Unit

1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2009.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-27 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 23 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SI.08)
Paper No(s)/Mail Date 06/23/06; 01/25/08
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Applicant's Arguments/Remarks Made in an Amendment filed October 23, 2009.

Response to Arguments/Remarks

1. Regarding the rejection of Claims 1-5 and 25-27 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1) and Matsumoto et al. (US 2005/0098207 A1), the applicant argues on page 18 that independent Claims 1-3 recite an aryl group having 6-25 carbon atoms. However, according to the general formula as disclosed by Kitahora et al., $Ar_3 = Ar_4 = Ar_5 =$ phenyl group ([0034]) such that the total number of carbon atoms is 18 for R_1 .

The applicant claims on page 18 that the prior art, either alone or in combination, does not teach the presence of the carbazole derivative with the metal oxide. However, motivation clearly exists as disclosed by Aoki et al. in which metal oxides such as vanadium oxides are known to be conventionally added to hole-injecting layers in order to improve light emission properties ([0095]).

The applicant claims on page 18 that Matsumoto et al. does not appear to teach or suggest the claimed amine. However, motivation still exists to incorporate the carbazole derivative as disclosed by Kitahora et al. to the charge-generating layer since Matsumoto et al. nonetheless teaches the combination of an hole-transporting arylamine compound with vanadium oxide. Because the carbazole derivative as disclosed by Kitahora et al. is a known hole-transporting material used in organic EL

devices and fulfills the teaching of being an arylamine, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate into the layer.

2. Applicant's arguments with respect to the rejection of Claims 6 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Richter et al. (US 2005/0076951 A1) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1).

3. Applicant's arguments with respect to the rejection of Claims 7-11 and 13-17 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kanamaru et al. (JP 2000-056491 A) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1) and Matsumoto et al. (US 2005/0098207 A1).

4. Applicant's arguments with respect to the rejection of Claims 12 and 18 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), Kanamaru et al. (JP 2000-056491 A), and Richter et al. (US 2005/0076951 A1) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1).

5. Regarding the rejection of Claims 19-23 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1), the applicant argues on page 25 that it would not have been obvious to obtain the compound as shown on page 14 in the previous Office Action filed July 23, 2009. However, motivation to substitute a carbazole group for X in the general formula as disclosed by Kawamura et al. (General formula (1), col. 2) can be further due to the fact that X = single bond (col. 4, line 53) and R^7 and R^8 = form a 5-membered ring (col. 4, line 61), in addition to the fact that already discloses nitrogen-containing aromatics for X (PD-50, col. 33) and that carbazole groups are widely known and established in the art.

6. Applicant's arguments with respect to the rejection of Claim 24 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 2008-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), Kawamura et al. (US 541,129 B1), and Richter et al. (US 2005/0067951 A1) have been found to be persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1).

7. Regarding the rejection of Claims 7-11, 13-17, and 19-23 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Ly (US 2004/0185299 A1), the applicant argues that Ly does not teach, either alone or in combination, the features of the claimed invention. However, the clear motivation exists since the carbazole compound as disclosed by Ly is highly analogous with the same basic phenyl groups to the carbazole compound as disclosed by Kitahora et al. and possesses the same hole-transporting properties for use in an organic EL device, such that the substitution would have been predictable with a reasonable expectation of success. The arguments in regards to the combination of Kitahora et al. in view of Aoki et al. and Matsumoto et al. have been described above.

8. Applicant's arguments with respect to the rejection of Claims 12, 18, and 24 under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 2008-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), Ly (US 541,129 B1), and Richter et al. (US 2005/0067951 A1) have been found to be persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1) and Matsumoto et al. (US 2005/0098207 A1) and Kawamura et al. (US 541,129 B1).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

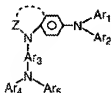
2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

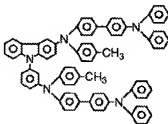
3. Claims 1-5, 7-11, 13-17, and 25-27 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US

2001/0022497 A1) and Matsumoto et al. (US 2005/0098207 A1) as described previously in the Office Action filed July 23, 2009.

Regarding Claims 1-5 and 25-27, Kitahora et al. discloses a light-emitting element comprising an anode, hole-transporting layer, light-emitting layer, electron-transporting layer, and a cathode ([0078]). Kitahora et al. discloses an oxadiazole compound (that has electron-donating properties) to be in the electron-transporting layer and aluminum tris oxine as the light-emitting substance in the light-emitting layer ([0133]). Kitahora et al. discloses that such light-emitting elements are applicable to various kinds of display devices ([0105]). Kitahora et al. discloses an amino compound represented by the following general formula to be in the hole-transporting layer ([0078]):



((I), page 2), where one such example compound is disclosed:



((19), page 7) such that R¹ = aryl group having 25 carbon atoms (substituted phenyl group), R² = hydrogen, Ar¹ = aryl group having 7 carbon atoms (substituted phenyl group), Ar² = Ar³ = aryl group having 6 carbon atoms, and X = bivalent aromatic

hydrocarbon group having 12 carbon atoms (biphenyl group). It would have been further obvious to substitute the N-substituted phenyl group for triphenyl amine such that R^1 = aryl group having 18 carbon atoms. The motivation is provided by the fact that Kitahora et al. allows $Ar_3 = Ar_4 = Ar_5$ = phenyl group ([0034]) in the general formula ((19), page 7). Kitahora et al. discloses the hole-injecting properties of such carbazole derivatives ([0136]). However, Kitahora et al. does not disclose an inorganic compound to be in the hole-transporting/injecting layer with the carbazole derivative nor a fourth layer that contains the carbazole derivative and an inorganic compound.

Aoki et al. discloses the use of vanadium oxide can be used to improve hole-injecting properties of a hole-injecting layer in an organic EL device ([0095]). It would have been obvious to one of ordinary skill in the art at the time of the invention to add vanadium oxide as disclosed by Aoki et al. to the hole-transporting/injecting layer of the light-emitting element that contains the carbazole derivative as disclosed by Kitahora et al. The motivation would be that the vanadium oxide will improve light emission properties and efficiencies due to its ability to improve hole injection into the light-emitting layer.

Matsumoto et al. discloses a charge-generating layer (16) to be directly adjacent to the cathode (Fig. 1). Matsumoto et al. discloses the composition of the charge-generating layer: an electron-donating (hole-transporting) compound such as an arylamine compound and vanadium oxide ([0158]). The arylamine compound is represented by the following formula:



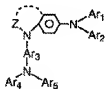
([0159]) where Ar₁, Ar₂, and Ar₃ each independently represent an aromatic hydrocarbon group which may have substituents. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate this charge-generating layer adjacent to the cathode as disclosed by Matsumoto et al. to the light-emitting element as disclosed by Kitahora et al in view of Aoki et al. The motivation would be that such a layer would increase light emission properties and efficiencies due to its ability to inject holes and electrons into the cathode and anode, respectively. In addition, it would be further obvious to substitute the carbazole derivative as disclosed by Kitahora et al. for the arylamine compound as disclosed by Matsumoto et al. in the charge-generating layer. The motivation would be that the carbazole derivative is also an arylamine compound that has high electron-donating (hole-transporting) properties.

Regarding Claims 7-11 and 13-17, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute a phenyl for a biphenyl in the carbazole derivative in the organic EL device as disclosed by Kitahora et al. in view of Aoki et al. and Matsumoto et al. to produce the carbazole derivatives as recited in the claims. The motivation is provided by the fact that such a substitution would result in a homologous compound with similar physical and chemical properties resulting from the substitution of a biphenyl group for an obvious variant (phenyl). Moreover, Kitahora et al. allows a phenyl group (for Ar₂, (1), [0034]) for the other substituent of the amino group.

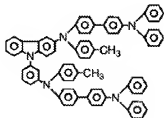
Regarding Claims 19-23, Kitahora et al. allows a naphthyl group (for Ar₂, (36), [0041]) for one of the other substituent of the amino group.

4. Claims 1-4, 6-10, 12-16, 18-22, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1).

Regarding Claims 1-3, 6-9, 12-15, 18-21, and 24-27, Kitahora et al. discloses a light-emitting element comprising an anode, hole-transporting layer, light-emitting layer, electron-transporting layer, and a cathode ([0078]). Kitahora et al. discloses an oxadiazole compound (that has electron-donating properties) to be in the electron-transporting layer and aluminum tris oxine as the light-emitting substance in the light-emitting layer ([0133]). Kitahora et al. discloses an amino compound represented by the following general formula to be in the hole-transporting layer ([0078]):

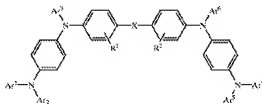


((I), page 2), where one such example compound is disclosed:

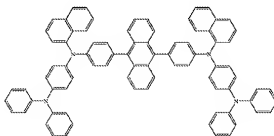


((19), page 7). Kitahora et al. discloses the hole-injecting properties of such carbazole derivatives ([0136]). However, Kitahora et al. does not disclose an inorganic compound to be in the hole-transporting/injecting layer with the carbazole derivative, a fourth layer that contains the carbazole derivative and an inorganic compound, nor a carbazole derivative that meets the limitations of formula (103).

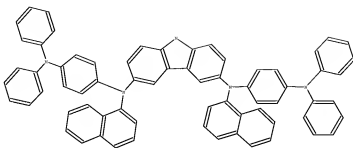
Kawamura et al. discloses the following compound capable of hole-transport represented by:



(General formula (1), col. 2). Kawamura et al. discloses a particular example:



(PD-02, col. 7) where the amino substituent attached to the anthracene derivative satisfies structural formula (104). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the 9,10-diphenyl anthracene in the derivative as disclosed by Kawamura et al. for a carbazole group to produce:



The motivation would be the fact that X = single bond (col. 4, line 53) and R⁷ and R⁸ = form a 5-membered ring (col. 4, line 61), in addition to the fact that Kawamura et al. already discloses nitrogen-containing aromatics for X (PD-50, col. 33) and that carbazole groups are widely known and established in the art.

It would have been further obvious to one of ordinary skill in the art at the time of the invention to substitute the above carbazole as disclosed by Kitahora et al. in view of Kawamura et al. for the carbazole derivative in the organic EL device as disclosed by Kitahora et al. The motivation lies in the fact that both are analogous carbazole derivatives with known hole-transporting functions for use in organic EL devices such that the substitution would have been predictable with a reasonable expectation of success.

Aoki et al. discloses the use of vanadium oxide can be used to improve hole-injecting properties of a hole-injecting layer in an organic EL device ([0095]). It would have been obvious to one of ordinary skill in the art at the time of the invention to add vanadium oxide as disclosed by Aoki et al. to the hole-transporting/injecting layer of the light-emitting element that contains the carbazole derivative as disclosed by Kitahora et al. in view of Kawamura et al. The motivation would be that the vanadium oxide will

improve light emission properties and efficiencies due to its ability to improve hole injection into the light-emitting layer.

Matsumoto et al. discloses a charge-generating layer (16) to be directly adjacent to the cathode (Fig. 1). Matsumoto et al. discloses the composition of the charge-generating layer: an electron-donating (hole-transporting) compound such as an arylamine compound and vanadium oxide ([0158]). The arylamine compound is represented by the following formula:



([0159]) where Ar₁, Ar₂, and Ar₃ each independently represent an aromatic hydrocarbon group which may have substituents. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate this charge-generating layer adjacent to the cathode as disclosed by Matsumoto et al. to the light-emitting element as disclosed by Kitahora et al. in view of Kawamura et al. and Aoki et al. The motivation would be that such a layer would increase light emission properties and efficiencies due to its ability to inject holes and electrons into the cathode and anode, respectively. In addition, it would be further obvious to substitute the carbazole derivative as disclosed by Kitahora et al. in view of Kawamura et al. for the arylamine compound as disclosed by Matsumoto et al. in the charge-generating layer. The motivation would be that the carbazole derivative is also an arylamine compound that has high electron-donating (hole-transporting) properties.

Regarding Claims 4, 10, 15, and 22, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the carbazole derivative in the organic EL device as disclosed by Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1) such that the carbazole nitrogen is substituted by a methyl group instead of hydrogen. The motivation is provided by the fact that Kawamura et al. discloses that X = substituted 5-member ring (col. 2, lines 35-36) in addition to the fact that a hydrogen to methyl modification is an obvious variation producing a compound with similar chemical and physical properties to make it predictable with a reasonable expectation of success.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. YANG whose telephone number is (571)270-1137. The examiner can normally be reached on Monday to Thursday from 8:30 am to 6:00 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

/J. L. Y./
Examiner, Art Unit 1794